

# Automated Testing & Board Farming

## OSS/ELC Europe 2022 - Topics and Notes

### Possible Topics (add 🚀 to vote)

- Chris: Are you using automated testing and board farming? What does your board farm look like? What has changed in the last one, two years? 🚀🚀🚀🚀🚀🚀
- Chris: Do you have any new remote control gadgets? 🚀🚀🚀🚀🚀
- Chris: What type of remote control is missing? 🚀🚀🚀
- Jan: Which existing test-suites are you using? 🚀🚀🚀
- Nishanth: sdwire vs sdmux: what is more widely used? Challenges? Alternatives? Shipment to USA was a challenge for sdmux.
- Tim: anyone doing hardware testing in their lab? 🚀🚀🚀
- Daniel: Is it possible to test hardware features in this way? (Secure & encrypted boot for example) 🚀🚀🚀🚀🚀🚀🚀🚀
- Phil: Who else has or had issues with USB and how did you overcome or debug them?
- Jordi: Some RTOS developers need a GUI application running on the same local network as the boards (latency issues). We tried ssh -X, and VNC, which were.. not great. Labgrid integration (mutex) would be cool. Any suggestions?
- Jordi: For testing network equipment, different network setups are required. We tried connecting the boards to a managed switch, but it was a mess, developers didn't quite understand how it works, and ended up connecting the cables directly. How do we help developers configure different network setups remotely?
- Are there any groups for discussing this further? 🚀🚀  
It would be great to keep talking to everyone after this meeting  
Tim: Some resources: [https://elinux.org/Automated\\_Testing](https://elinux.org/Automated_Testing),  
[https://elinux.org/Board\\_Farm](https://elinux.org/Board_Farm)  
mailing list: <https://lists.yoctoproject.org/g/automated-testing> (it says it's a yocto project mailing list, but we use it for general discussions)
- Bastian (remote): Experiences with automating repeated tasks, maybe automated git bisecting (kernel bugs etc.)? 🚀🚀
  - Focus on the automation aspect would be interesting
- AndyM: what software do people use to manage access to boards (e.g. labgrid)... how many home grown systems are there?
- Dirk E: is "expect" still a thing or do you use something else for testing serial stuff?
  - Andrea S: we develop a (closed sources for now ;-)) Python3 library for this. Allow sending a command (via UART, telnet, SSH) and parse it's output.
- Dave G: How do people cope when there is a powercut, all your pcs power cycle and the imminent power draw trips all the lab fuses?
  - Jordi: Some boards (our Poweredge T110 for example) allow setting a delay between power getting back up and the computer starting. Also, default as much devices you can to power off, and use Wake on Lan.

## Discussion Notes

- Chris: <shows some pictures of the PTX lab>
- Chris: since 2020 we replaced our one-wire GPIOs with CAN-based GPIO controller boards
- Chris: We use USB multiplexing a lot (i.e. switch a USB storage device from the host to the DUT for booting images)
- Tim: Is PTX using the TAC device for the USB switching?
  - Chris: No, that's a separate device.
- Does the Server include serial and power relay?
  - Chris: Yes. We want to cover 80% of cases with the device.
- Chris: What do your labs look like?
  - Tim: About my lab: Sony has custom HW to do power switching and measurement. Web power switch for power control. USB serial for serial console. Sony debug board is nice, But it's outdated and no longer in production. Someone mentioned the tasmota Sonoff? wifi power switches yesterday. Consensus seems that USB has many issues with larger setups.
  - shawn: We also see issues with USB. We're trying to move to a 1-to-1 setup.
  - Chris: Power switchable USB hubs help, as you can just power cycle the problematic device
  - Chris: We use Gude 8080 24-port network power strips (for 240V).
  - Chris P: I use [these](#) PDU switches (Ethernet controlled) - the issue is masses of cable management for devices that have their own inverters
  - Geert: We use a central ATX power supply (all my boards are 5V or 12V).
    - Chris: Doesn't work for us, because many boards use different voltages.
    - Geert: Would it be worthwhile to switch to 48VDC, and per-DUT DC/DC convertors?
  - Drew Moseley: Uses a laptop powersupply (12v) with ESP32 relais board with MQTT and HomeAssistant. Is looking for a web UI for controlling that.
    - Chris: labgrid has support for these power switches.
  - Geert: Uses shell script controls from the web UI.
  - ??? (TI): We have ~40 racks in Dallas, ~80 racks in india. currently using their own custom system, considering labgrid. They want to do network timing tests, and also need ways to capture display outputs.
  - Tim: Working for years on a physical device REST API project for lab resources. One API is for capturing display output, but not live. Output can be saved and postprocessed. Not automated yet.
  - ????: For the x86 we have something that works nicely. Some KVM switches do output capture and generate input events. There is also PiKVM which works very well.
  - Stefan: Has a pet project called PicoKVM, uses a small HDMI to USB converter. <https://github.com/stefanklug/picoKVM>
  - ????: There was a project called STB-Tester. Doesn't know the current state of that project.

- Oleksij: We are working on extending labgrid for network/PTP testing.
  - Tim: What does the API for this look like?
    - Bastian (remote): Mostly interface setup on a labgrid exporter (similar to <https://labgrid.readthedocs.io/en/latest/configuration.html#usbnetworkinterface> - not necessarily USB though), packet capture/replay, allows pcap analyzing via scapy (<https://scapy.net/> )
- Chris: New Gadgets?
  - ????: Use ykush USB hubs to switch unplug/replug devices.
  - ????: A wide USB topology is better than a deep topology. In sysfs there is a authorized file, write 0 to unbind the but below that.
  - Rouven: We recently added support to linux to control power of usb-ports via sysfs. We still need to support that in uhubctrl: <https://github.com/mvp/uhubctl/pull/450>
- Chris P: Can anyone link to a “good” USB hub?
  - Jan: <https://github.com/mvp/uhubctl/> has a list
  - Andrea S: we use industrial USB HUB for testing e.g. the one from [Startech](#)
- Daniel: Is it possible to test hw features in this way (i.e. secure/encrypted boot)
  - Chris: Yes, we can write the bootloader and control it.
  - Rouven: We have done that for one customer. Also tested AppArmor there.
- Chris: Which existing test suites are you using? We’re mostly using tests written for each customer? Collabora seems to use existing kernel test suites.
  - ??? (TI): We forked from LTP and added a custom runner. <https://git.ti.com/cgit/test-automation/> has two pieces: ltp-ddt is on target. Pc side: code is not public (framework for controlling hardware that then works with DUT) - we will be happy to collaborate to share.
  - ????: It’s hard to integrate ??? into a board test, because if disturbs the testing setup.
- Tim: Is anyone doing HW testing? Such as audio, serial off the board (not loopback)? Is working on APIs to control HW that’s not on your board, but part of the lab (video, audio, serial).
  - ??? 1: Often additional HW is needed to test the SW. i.e. bluetooth, wifi.
  - Geert: It’s very custom and board specific
  - ??? 1: He is missing management of these “shared” devices. So you need to allocation of those as well.
  - Rouven: We support Audio Capture in in labgrid, for wifi/bluetooth we just use a OpenWRT AP per lab that
  - Jan: Labgrid also support controlling USB WiFi/Ethernet devices.
  - Andrea S: we developed custom (modular) hardware for hardware testing (UART, 485, GPIOs, relais, LVDS video capture). For wifi/BT we use Linux Embedded devices with hostapd, BT and so on. Everything is controlled via FT4232H minimodule (so we can just plug a USB cable into a standard PC and control all this "embedded" interfaces)
  - Andrea S: for CAN bus we use a simple Arduino board that implements a echo-er

- Andrea S: for LVDS/HDMI we use one of our Zynq based SOM for capturing video and pattern matching. This device is then controlled via I2C (and a Python library)
- Tim: LabControl is Tim's project to create APIs to manage off-DUT lab hardware for testing
  - e.g. allocate hardware, start capture, stop capture, configure hardware, etc.)
- ????: They use a PCEngines board to host a Wifi-Card and control hostapd via the unix socket.
  - Jan: labgrid uses wpa\_supplicant via NetworkManager, not hostapd. so many advanced features are not yet controllable
- ????: we need to control multiple places
  - Jan: a single environment can contain multiple targets, reservations can also wait for groups of devices.
    - See <https://labgrid.readthedocs.io/en/latest/configuration.html#environment-configuration>
- ????: Is there support for automated bisection?
  - Rouven: Needs custom scripting in labgrid
  - ????: KernelCI does this already via LAVA.
- Could people update [https://elinux.org/Board\\_Farm](https://elinux.org/Board_Farm) with details on their setup?
- Which frameworks are in use:
  - Labgrid: 25%
  - lava: 25%
  - TTC/Fuego: 2
  - something homegrown and not public: ~30%
  - Testinfra: 1
- Please add a link to the monthly meetings:
  - Invitation: [https://elinux.org/Automated\\_Testing#Conference\\_call](https://elinux.org/Automated_Testing#Conference_call)
  - Currently: "We hold a conference call meeting monthly, on the second Thursday of each month, at 14:00 UTC time. "
  - Meeting minutes: [https://docs.google.com/document/d/1VgyvwSiIJS1BhoKgu\\_XF10caMhin8yrakH1sSGgr178/edit#heading=h.i0a3wqrs0h](https://docs.google.com/document/d/1VgyvwSiIJS1BhoKgu_XF10caMhin8yrakH1sSGgr178/edit#heading=h.i0a3wqrs0h)
  - Join <https://lists.yoctoproject.org/pipermail/automated-testing/> for last minute updates

## Links:

- Sched and Slides for this BoF: <https://sched.co/15z38>

- This document:

